

ICTs IN HOTEL MANAGEMENT: A RESEARCH REVIEW¹

Purpose: Hotels are dependent on ICTs both for their internal management and for their relationships with customers and the other stakeholders. That is the reason why research on ICTs in the hotel sector has kept growing lately. The present paper offers a review of the literature dedicated to ICTs in the hotel management, analyzing the papers published in 7 prestigious journals from the field of *Hospitality Management*.

Design/Methodology/Approach: The 147 papers analyzed –published over a 27-year period– have been studied according to a variety of criteria such as their research methods, perspective, statistics utilized, topics covered, technologies, authors and countries.

Findings: The conclusions suggest a promising future regarding both ICT applications for hotel management and research in this area.

Research limitations/Implications: Concerning limitations, the most important one stems from the selection of works subject to examination, since our analysis dealt with papers published in only 7 journals, other publication sources being left aside. Nevertheless, the present paper can prove useful both for researchers and for hotel managers, since new trends are emerging in both contexts, with regard to technologies themselves as well as to some of their uses.

Originality/value: One of the most important contributions made with this work is the preparation of a list with the topics covered by the papers under examination. Also, to our knowledge, no studies have so far specifically tried to identify the technologies utilized in hotel management by means of a literature review.

Keywords: ICTs, hotels, papers, literature review

1. INTRODUCTION

Information and Communication Technologies (ICTs) play a basic role in the tourism sector as a whole and regarding hotel management in particular, since hotels characteristically make an intensive use of information. The services related to a hotel are perfect candidates for interactive technologies, insofar as its products constitute natural candidates for a multimedia description.

Many customers are living in a SoLoMo (Social, Location, Mobile) environment. These customers become consumers as well as creators of contents, and their opinions influence the reputation and sales of numerous businesses, including those associated with hotels. Furthermore, each breakthrough in ICTs –such as mobile technology, for example– implies a new challenge in hotel management. To which must be added that the much-trumpeted paradox of ICT productivity (Brynjolfsson, 1993) has been treated in hotel management as well (Karadag and Dumanoglu, 2009); investment in ICTs has meant higher productivity, though simultaneously encountering resistance (on the part of workers as well as of potential customers), training expenses and, undoubtedly, a considerable economic outlay.

All the previous reasons, amongst others, have resulted in an increased study of ICTs in hotel management. Hence why the present work aims at analyzing the increasingly large body of literature about ICTs in hotel management. Previous studies have analyzed ICTs in relation to hotel management. By way of example, O'Connor and Murphy (2004), Hung and Law (2011), Ip

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et al. (2011), Law et al. (2013), Law et al. (2014), Serra Cantallops and Salvi (2014) and Leung et al. (2015b).

Despite the significant contribution made by the aforementioned works, a need still exists for a comprehensive and updated review of what research has hitherto dealt with as far as ICTs in hotel management are concerned. Doing this will allow us to acquire a better understanding about the state of the art regarding the study of ICTs in hotel management, thus helping to ascertain the progress made in this study area and shedding light on future paths regarding lines of research.

With this aim in mind, we are going to answer the following questions: what research methodologies are the most often utilized? which perspective is adopted to analyze reality? what statistical techniques are more frequent? what topics does research cover? what technologies are dealt with? which are the most prolific authors and countries? In short, it is our intention to improve the knowledge about this important study area where ICT management and hotel management are intertwined.

2. DATA COLLECTION

The first task to delimit our subject matter consists in determining which works about ICTs in hotel management are going to be examined here. We will focus on studying papers published in journals of recognised prestige in the fields of *Hospitality and Tourism*. We thus leave aside both books and papers presented to conferences.

Table 1 shows the journals which serve as the basis for our analysis of the literature about ICTs in hotel management. Our main references to prepare this list of journals were the studies by authors such as O'Connor and Murphy (2004), Ip et al. (2011), and Leung et al. (2015b), who undertook a review of the literature related to ICTs in hospitality management.

INSERT TABLE 1

Our search focused on the PROQUEST database (corresponding to November and December 2016). We looked for papers published in the aforementioned journals until 2016 which contained “in whatever field except for the full text” some of the following terms: CRS; e-Tourism; eWOM; GDS; GIS; GPS; Information Systems; Information Technology; Intelligent agents; Intelligent interface; Internet; Social networks; and Website. A list came out of all these terms, and the three researchers who sign this paper did a brainstorming exercise to determine the final keywords, a method used by previous researchers such as Hung and Law (2011) too. We removed those papers which were either editor's notes or reviews of web pages, exclusively analyzing papers from these journals which additionally dealt with the topics of *Hospitality* or *Hotels*. A manual search followed the electronic one, especially tracking the works cited by the bibliography in the already selected papers. We set no date limits in our search, since our aim consisted in examining ICT-related literature in hospitality management over time. This left us with 147 papers –of which we analyzed the full text– that are shown in the Appendix.

Table 1 also provides the number of papers published in each one of the journals analyzed. IJCHM is the most prolific journal when it comes to these topics, with 49 papers published about them (33.3% of all papers).

3. RESULTS

Our explanation of the results obtained will start with the specification of the time period as well as the journals analyzed, after which we will focus on identifying the research methods utilized (empirical or theoretical), as well as on describing the perspectives adopted (that of the user, that of the hotel, or both) and the statistical techniques that the examined papers most often resort to.

Our work will subsequently pay attention to the topics covered in the articles and to the technologies studied in them. The presentation of our results will finish with the identification of the most prolific authors and countries as far as the analysis of ICTs in hotel management when it comes to the papers under study.

3.1. Period analyzed

Our analysis has focused on 147 papers published during a 27-year period. Seeking to facilitate the study of time evolution in these papers, this period has been divided into three stages:

- (a) we firstly examine the works published prior to 1999, which were only 5 (3.4%);
- (b) the second stage covers the papers published from 2000 to 2009 (48 works in all; i.e. 32.6%);
- and (c) the third one corresponds to the publication period comprised between 2010 and 2016 (94 papers; that is, 63.9%).

The publication of papers about ICTs in hotel management has steadily and significantly grown throughout the period under examination.

3.2. Research methods, perspective and statistics

3.2.1. Research methods

Our classification of papers according to the research methodology used took as its essential reference the paper written by Gonzalez et al. (2013), in turn based on the work of Van Horn (1973) to classify empirical works.

INSERT TABLE 2

It becomes visible (Table 2) that only 10 of the analyzed works are theoretical; these works are based on ideas and conceptual structures, rather than on a systematic and direct observation of reality. Whereas 2 out of 5 published works (40%) were theoretical during the first period subject to study, both the second and the third period show 4 published papers which, however, account for a lower percentage of the publications made in these two periods (4 out of 48 represents only 8% of all that that was published in the second period; and 4 out of 94 accounts for even less – 4%– in the third period). This allows us to say that, as this research field has gradually matured, scholars have started to focus on directly observing reality, instead of speculating about it from outside, with a merely theoretical approach.

As for the empirical works, we divided them into: Field Studies; Content Analysis; Experiments; Case Studies; Literature Reviews; Combination of Case and Field Studies; and Experts' Panels. Field studies –the largest group (39.5% of all the papers analyzed)– predominantly adopt a quantitative perspective when collecting the data required to carry out the research work, most often based on survey utilization. In such papers, the researcher gathers information about uncontrolled situations, thus avoiding any possible alteration in its study object. This method clearly prevails over the rest in all the time periods examined.

The second group was formed by papers based on Content Analysis (39 papers, i.e. 26.5% of the total). Despite the absence of works using this method in the first period under study, they became increasingly important during the following periods. Papers structured around Content Analysis work with secondary information; in other words, information which was already available on websites or databases to which the researcher subsequently has access.

Our third focus of interest corresponded to a group of 18 papers (ca. 12.2% of all) which have an Experiment as their data collection method. It becomes clear once again that, even though no papers were written using this method during the first period, its presence became more and more

important over time. An experiment features the analysis of a phenomenon within a scenario (an environment) other than the one in which an organization usually carries out its activity. The researcher builds a model to replace it by the study of reality. The model may sometimes be a set of equations or any other symbolic representation of a problem, but it is more often a physical representation of that problem. In the context of our study, experiments constitute the preferred option when we place the person or persons from whom information must be collected in a specific situation, thus provoking a simulation of certain circumstances.

The fourth group examined brings together 12 papers which applied the case method, 6 of them published between 2000 and 2009, and the other 6, between 2009 and 2016. This method serves to examine a phenomenon in its natural environment, obtaining data in different ways, especially by means of interviews, but also through the analysis of documents or direct observation. Being a qualitative method (unlike the field study), it is more difficult to generalize the conclusions drawn. We can draw a distinction within this group between works referring to multiple cases (e.g. the one written by Hills and Cairncross, 2011) and single-case ones.

Our study will now pay attention to another 7 papers which, the same as the present one, revolve around a literature review. Only one of them appeared during the period going from 2000 to 2009 (O'Connor and Murphy, 2004), while the remaining 6 were published in the last analyzed period. This increase in the number of papers which carry out a literature review is normal because, as time elapses and the volume of research on ICTs and *Hospitality* grows, an increasingly high number of works focus on reflecting what we have managed to know about these topics so far.

Finally, two papers stood out for combining the Case and Field methods, and another one was based on information provided by a panel of experts. Table 5 of the Appendix specifies the method used in all the papers under analysis.

3.2.2. Perspective

It refers to the point of view adopted when drawing up the analyzed work is prepared; in other words, that of hotels, that of their users or potential users, or that of both at the same time. In the first case, the author writes his paper on the basis of interviews with managers of hotels, or with hotel workers in general, or using information provided by the hotels themselves. This is consequently a perspective where the hotel supply point of view prevails.

With regard to the second case, the authors of such papers draw on information supplied either by real or by potential hotel customers. They consequently follow the users' perspective or that of the hotel demand in an aggregate manner.

Finally, a number of papers have also tried to offer a holistic perspective, taking into account information that simultaneously comes from the perspective of hotel service supply and demand.

Table 2 shows that quite a balance exists in numerical terms between the perspective of hotels and that of users, insofar as 42% of works were written from the hotel's point of view, and 40% from that of users. The number of papers which took into account the holistic perspective is much smaller, though. It additionally becomes visible that the user's perspective, and even the holistic one, have been growing to the detriment of the hotel-centered perspective, with a slightly lower number of papers published from this point of view in the last analyzed period. Therefore, despite being balanced, the research perspective arguably seems to grow more often than not from the service demand point of view.

3.2.3. Statistical techniques

The same as Leung et al. (2015b) did, our paper examines the statistical techniques utilized in the papers under study (Table 2). Even though a paper does not necessarily have to use a single

technique and, of course, it can use several ones, each work was designated according to the most complex technique that it utilizes, understanding that such complexity gradually increases in merely *descriptive* statistics, continuing with *univariate analyses* (e.g. means difference test, ANOVA, ANCOVA, Chi-square, and crosstabulation), *multivariate analyses* (such as regression, discriminant analysis, factor analysis, cluster analysis, or multidimensional scaling), and finally, SEM (Structural Equation Model) analyses and Path (or pattern) analyses which, despite being multivariate too, are counted separately because of their growing importance and use.

It follows from the total count of papers that multivariate techniques are the most frequently used, followed by univariate and descriptive ones and, finally, by the most complex analyses (SEM/Path). Nevertheless, the evolution over time shows us –with respect to the total published during each period– the reduction of merely descriptive analyses, the stagnation of univariate analyses, and the progressive growth of works that use multivariate or SEM/PATH techniques, which were non-existent in the first period examined and grew to a large extent during the second period, and even more so in the third analyzed period.

3.3. Topics

The analysis about the topics covered in the papers examined appears in Table 3, which shows their appearance by periods of time, the number of papers which deal with each topic, and the percentage that they represent over the total. The sum of all topics is 240, even though we only analyzed 147 papers. The explanation for this lies in the fact that a single paper can deal with more than one topic. Our determination of topics was based on the previous literary review papers written by Hung and Law (2011), Law et al. (2013), Law et al. (2014), and Leung et al. (2015b). The names given to the topics is not identical to those used in the aforementioned works, though, and some topics such as *Location* or *Reputation* had not been present at all in previous studies. When carrying out the present classification, we neither tried to limit categories nor took preconceived ideas as a reference; the idea was to have an open classification format; new topics appeared as new papers were published (Smith and Kumar, 2004). The topic-based classification of all the papers examined is also available in Table 5 of the Appendix.

INSERT TABLE 3

3.3.1. *eWOM*

The most frequently used topic was *eWOM* (Electronic Word of Mouth), dealt with in 39 papers. This topic has to do with the influence that the dissemination of opinions by service users may have on other users when it comes to making purchase decisions. Obviously, the existence of technologies such as broadband Internet or the Web 2.0 has increased the information contents generated by users themselves, and this information is taken into account by future users when they make their travel plans; hence why hotel management needs to pay attention to it as well. Social networks, both those specifically related to travel and the generic ones, contribute to the dissemination of *eWom* information.

3.3.2. *Online Booking*

The second most important topic, in accordance with the number of papers dedicated to it (31 papers, or 12.9%) is *Online Booking*. This thematic area includes papers which deal both with online reservations and with the online purchase intention, as well as with the decision-making process in relation to purchases.

3.3.3. *Web Characteristics*

The third place in order of importance by the number of published works (30) is *Web Characteristics*. This name brings together those papers which try to identify the characteristics that hotel websites should have in order to become more effective.

3.3.4. *Innovation/ICT Use*

The topic *Innovation/ICT Use* was present in 27 of the papers analyzed (i.e. 11.3% of all), which describe the innovation management strategies regarding ICT use implemented either by hotels or by their users. Many of these papers use the TAM (Technology Acceptance Model) model as a way to describe how and why new technologies are accepted, whether from the hotel's point of view or from that of the traveler. Other works analyze the factors that boost or inhibit the implementation of such technologies; and some merely carry out an 'inventory' of the technologies and applications utilized by hotels.

3.3.5. *Satisfaction*

In fifth place, 15 papers referred to the topic of *Satisfaction*, focusing on how satisfaction, and even the loyalty and reliability associated with the specific services delivered by a hotel is likely to depend on ICT use.

3.3.6. *Performance*

A total of 14 papers specifically referred to the way in which ICT introduction or use can determine hotel *Performance*, or results. For many years, researchers have stressed that the relationships between investment in ICTs and corporate results are far from easy; they actually have a high level of complexity and manifold aspects to bear in mind, which is why a need exists to continue examining the links between ICTs and Performance.

3.3.7. *Multiple Channels*

The same number of papers (14) covered the topic of *Multiple sale Channels* according to the ICTs available to hotels. Amongst others, the works of Ling et al. (2015), Law et al. (2007), Lee et al. (2013b), or Karande and Magnini (2011) deal with the sale of rooms in hotels, not only through their own websites but also using other online channels, such as OTAs (Online Travel Agencies) that we will describe in more detail below.

3.3.8. *eMarketing*

Despite the fact that many of the papers analyzed deal with some ICT aspect related to marketing, since the ultimate aim consists in attracting, fidelizing and retaining customers, we analyzed 10 works directly linked to *eMarketing*.

3.3.9. *Strategy*

Another 10 works deal with *Strategy*, explaining how hotels can develop an ICT-based strategy.

3.3.10. *Reputation*

The topic of online *Reputation* is present in 9 papers which describe how ICTs can help consolidate and improve the image of a hotel. In this respect, Magnini and Honeycutt (2009) point out, for example, that adding a .sig file with basic information about the hotel costs nothing but actually helps strengthen a brand identity. More recently, the use of social networks has made it possible to create virtual communities whose comments may prove beneficial or detrimental to hotel reputation.

3.3.11. *Prices*

The topic of *Prices* constitutes the focus of attention in 7 out of 147 papers examined. Using the Internet and multiple distribution channels to commercialize rooms may result in the existence of different prices for the same service.

3.3.12. *Legal Issues*

The same number of papers –7– deal with *Legal Issues* concerning ICT use in hotels. Most of these works refer to such matters as the security and privacy of information related to customer, the legal clauses attached to online reservations, and whether online travel agents (OTAs) must pay taxes for the amounts that they pay to hotels or for the higher price that they charge to their customers.

3.3.13. *Literature Review*

Another 7 papers –the same as ours– perform a review of the literature on ICTs and hotels.

3.3.14. *Intermediation*

As for *Intermediation*, it turned out that 6 papers dealt with this topic. Even though intermediaries have always been present in hotel management, as exemplified by conventional travel agencies, intermediation services are not only growing but also becoming varied and infinite thanks to ICTs. Some of the topics mentioned above, such as the different prices or the multiple distribution channels, have to do with this intermediation.

3.3.15. *Human Resources*

A group of 5 papers focus on HRs (Human Resources), since ICTs can prove useful both for training and to make workers' tasks more agile, or even as a tool to recruit staff and to communicate with them. In this respect, it is of paramount importance to know the acceptance of technologies, as well as the intentions to use them, by the hotel staff.

3.3.16. *ICT Applications*

Another 4 papers deal with *ICT Applications* for customers, such as self-service systems by means of which customers can do the check-in or check-out automatically, or services such as pay-TV, electronic safe, automatic alarm-clock service, energy sensor, Internet access, and others.

3.3.17. *Location*

Only 3 works focused on ICTs associated with the topic of Location in hotels, namely which describe the possibilities of GIS technology as a hotel location tool, and the one which deals with GPS (Global Positioning System) technology.

3.3.18. *Others*

Finally, we categorized the topics covered in 2 papers as *Others*. One is the work authored by Law and Lau (2000), whose focus was placed on the risk of the so-called Y2K, a computer problem derived from the habit of omitting the century for date storage purposes that programmers had developed. The paper written by Karadag et al. (2009) analyzed the Method for the Selection of Investments in ICTs most frequently used in US hotels.

INSERT FIGURE 1

Figure 1 expresses graphically how the topics dealt with in the different papers have evolved over time. It becomes evident that, during the first period examined, in which only 8 works appeared in the publications under study, the topics covered exclusively referred to Intermediation, Strategy or Innovation, and ICT Use; these are consequently the oldest topics. It also becomes evident that

many of the topics received much more intensive attention during the last analyzed period, such as eWOM, Online Booking, Satisfaction, the use of Multiple Channels, and Online Reputation, in particular. On the whole, the study of all topics clearly seems to have increased its depth in recent years.

3.4. Technologies

To our knowledge, no article dedicated to the review of the literature on ICTs in the hotel sector has tried to identify the most frequently analyzed technologies when doing research about this topic; hence why the contribution made in Table 3 can prove useful. Our intention was to determine the specific ICTs that each one of the papers examined was referring to. Needless to say, the same paper can deal with one or several technologies; that is why the total number of technologies analyzed amounts to 173 (even though only 147 papers were examined).

We can easily see that 41 papers have analyzed Web technology in detail, which is in keeping with the preceding section, which showed that the topic ‘characteristics of hotel websites’ had appeared very often. 33 papers refer to ICTs in General. We have grouped together here those works which do not specify the ICTs that they are covering, or those which deal with technologies analyzed in only one paper, such as EDI systems, credit cards, or front office systems. We decided to exclude one paper about Big Data because, in our opinion, this technology has too much relevance to appear under the heading ‘ICTs in General.’

The topic of social Networks, both those specifically linked to travel (online travel communities) and generic ones (online social networks), has led to the publication of numerous papers, amongst them those dedicated to eWOM –the most commonly examined topic. It thus comes as no surprise that 31 and 18 works, respectively, dealt with travel-related or generic social networks. Amongst travel-related social networks stand out TripAdvisor and Flyertalk, whereas the most popular generic social networks are Facebook, Twitter, LinkedIn, and YouTube.

A total of 16 papers deal with such OTAs (Online Travel Agencies) as Booking, Expedia, or Venere. OTAs not only turn out to be useful for hotels as distribution or sale channels; they also constitute forums (similarly to travel-related or generic social networks) where users have the chance to assess the services received, which in turn allows potential users to be adequately informed before carrying out their reservations; hence their importance.

Another 12 papers deal with the Internet technology as a whole, including the one written by Noone and Mattila (2009).

As for the evolution over time of the technologies covered, it is worth highlighting that both travel-related and generic social networks, as well as OTAs, have increased their presence in the papers examined during the last time period. To this we can add that mobile technologies (which place us in the SoLoMo era), location technologies (GIS/GPS) and Big Data (to which only one paper refers) have appeared in the papers under study during the last analyzed period; in our view, they all have great potential in the near future.

3.5. Authors and countries

Out of 147 papers examined, only 16 (10.9%) were written by a single author, whereas the others (i.e. 131, or 89.1%) were co-authored, which allows us to state that the tendency to co-authorship prevails. This may be due to the fact that the growing complexity of research topics makes it necessary for more researchers to work together in order to ensure that their effort will be a fruitful one (Law et al., 2013). Figure 2 additionally shows that this tendency to co-authorship becomes even more evident as time elapses, having verified that a statistical dependence exists between co-authorship and the period of publication of the different works (Chi-square= 17.091, Sig. = 0.0).

INSERT FIGURE 2

Table 4 shows the number of papers published by each author, amongst those analyzed, together with each author's country, the latter corresponding to the university or *body/institution* where the author was working at the time of publication. N has been counted in the table 4 as the number of times that an author publishes one work, either as a co-author or alone, and regardless of the signing order in co-authorship cases. We are well aware of the fact that these groups of writers may not include some authors who, despite having made an outstanding contribution to the study of ICTs in the hotel sector, have not published anything in the journals under study –of course, they will most probably have done so in other media, such as conferences, books or other journals. For this reason, Table 4 does not really constitute a ranking, even though it can give us an approximate picture of the authors who have made a more significant contribution to the study of these topics.

INSERT TABLE 4

Although the most prolific author amongst the papers examined is by far Professor Rob Law, from Hong Kong Polytechnic University (China), the United States actually appears as the country which has contributed to a greater extent to research on ICTs, followed by China, the United Kingdom, Spain, and other countries, as can be seen in Table 4. We prepared this table taking as a reference the country of origin of each author who signs a paper, N being the number of times that the researcher from one country publishes a paper. Therefore, N shows how prolific a country is when it comes to the number of papers, or researchers, or both.

4. DISCUSSION AND CONCLUSIONS

4.1. Conclusions

Given the importance of ICTs in the hotel sector as a whole and particularly in hotel management, the present paper had as its aim to study the literature on ICTs in hotel management through the analysis of 7 prestigious academic journals. It became clear that research efforts to analyze this topic were not really significant until 2000, and also that this trend has kept increasing since 2010. The rise in the number of studies is linked to the advances in ICTs and their adoption by the hospitality sector; in fact, ICT rapid development has led to an unprecedented revolution in the hospitality industry. These technologies arise as new useful tools for hospitality management, as a platform to link suppliers and costumers, and becoming an integral part of hospitality firm competitiveness (Ip et al., 2011).

The papers subject to evaluation followed a variety of research methods, empirical works clearly prevailing over those of a merely theoretical nature. To this we can add that, amongst empirical methods, the two most frequently used methods were: (a) the survey-based field study; and (b) content analysis, based mainly on examining the contents of web pages or of different social networks. The works under study were written from the perspective of the supply, that is, of hotels, or from that of the demand; in other words, that of the actual or potential customers of those hotels, with only few papers conceived from a holistic perspective which simultaneously takes into account the points of views of users and hotels. Nonetheless, both the holistic perspective and that of the user have gradually grown to the detriment of hotel-centered perspectives.

The study of the specific statistical techniques used in the examined papers allows us to speak about a growing formalization in this study area, as shown by the fact that the numbers of merely descriptive or univariate analyses are increasingly low compared to multivariate statistics or other techniques such as SEM/Path analyses. The variety of research methods, the broadened study perspective –many research works having a holistic approach (about the customer and about the

hotel)— and the diversity and complexity of the statistical techniques utilized, without discarding qualitative research, reflect a gradually improved academic level of the papers dedicated to ICT in hospitality management. The scientific and academic level of this study area has progressively improved, as evidenced by the growing number of articles analyzed over time in our study, which were published in first-rate journals, judging by their high rankings in various academic databases.

Even though a professor of Chinese origin (Hong Kong) stands out for being the most prolific one amongst the authors analyzed, the United States ranks first when it comes to publications about ICTs in hotel management, followed by China and the United Kingdom. This comes as no surprise taking into account the preponderance of Anglo-Saxon countries in the study of ICTs.

4.2. Theoretical Implications

An additional contribution made with this work is the preparation of a list with the topics covered by the papers under examination. The topics covered in the papers about ICT in hotel management analyzed were: eWOM; Online Booking; Web Characteristics; Innovation/ICT Use; Satisfaction; Performance; Multiple Channels; eMarketing; Strategy; Reputation; Prices; Legal Issues; Literature Review; Intermediation; Human Resources; ICT Applications; Location; and Others—such as Y2E and Selection Investment Criteria in ICT. Although our choice of topics was based on previous literature review papers, the names given to topics are not identical to those used in such preceding works. Overall, we can say that the treatment of all topics has intensified during the last few years, due to the growing number of publications, but such relevant topics as eWOM, Online Booking, User Satisfaction, the use of Multiple channels, and online Reputation deserve a special mention too.

We were surprised by the small number of papers dedicated to the role of Human Resources in relation to ICTs, taking into account that, unless our staff is well trained and fully aware of the advantages brought by these technologies, they will not be able to offer their whole potential. This topic, together with the role played by IS and ICT managers, and that of the ICT department, in hotels appears to be marginal after the literature review when, in fact, they are all of paramount importance and should receive much more attention in our view. Despite the fact that hospitality companies spend millions on ICTs every year, few articles have hitherto dealt with issues such as: how to educate the staff so that they can be aware of technological innovations; how technology influences staff effectiveness, productivity and morale; and how ICT departments are ruled in the hospitality sector—in sum, how to manage ICT resources in hotels. These are some of the lacks which, in addition to being detected in research lines in the past (O'Connor and Murphy, 2004), have also been identified in the present study; for this reason, they need to be addressed in the near future.

To our knowledge, no studies have so far specifically tried to identify the technologies utilized in hotel management by means of a literature review. The present research work allowed us to detect that the most commonly cited one is the Web technology, followed by ICTs in general, and social networks, either travel-related or generic ones. It deserves to be highlighted within this section devoted to technologies that only one article covered the topic of Big Data despite all its potential. This technology entered many disciplines as a new paradigm, but there is still little research about it in the field of hospitality management. Hence why it is likely to become one of the most fruitful areas in the near future, insofar as Big Data analytics could be used to understand customers, competitors, market characteristics, products and business environments, as well as the impact caused by technologies and strategic stakeholders such as alliances and suppliers (Xiang et al., 2015).

Becoming aware of the evolution and the state of the art of ICT use in Hotel Management through this literature review can improve academics' understanding about how to utilize ICTs in hotel

management. It can be additionally helpful for them to plan research paths and to design their own research works. We have detected in this respect that an increasing number of studies analyze ICTs in hotel management both from a user's perspective and from a holistic one (user and hotel at the same time). In our view, there is room for many more research papers structured from such a holistic perspective, insofar as the comparative analysis of hotel supply and demand will surely generate more ideas about ways to really integrate ICTs into hotel management.

Furthermore, it is necessary for us academics to use our research as a means to transmit the idea that ICTs constitute a strategic element which needs to be an integral part of the highest-level decision-making in hotels, moving away from a merely theoretical tool at the service of the top management. This conclusion is in keeping with the work of Law et al. (2013), according to which research must help reduce the gap between hospitality managers and ICT experts: "Managers are concerned about service quality and customer relationships, whereas the IT expert focuses on rapid application development and server protocols. Appropriate studies will show the hospitality industry how to integrate IT into service quality improvement and to understand the value of different ICT applications."

4.3. Managerial Implications

This study can prove useful for practitioners, since the treatment of the most important issues analyzed reveals the practical applications of ICTs for hotels. The analysis of such issues unveils that the end customer or consumer uses ICTs in a growingly intensive way, achieving a greater negotiation power before hotels, because those customers or consumers have more information at their disposal, and they can compare and express their opinion, as well as their degree of satisfaction, which ultimately influences hotel reputation. Hence why practitioners need to listen to their customers, to analyze their demands, so that hotels can adapt to those demands, foresee them or anticipate them, covering and even discovering new needs. The utilization of technologies such as Big Data (not sufficiently studied in the literature) may prove helpful in the detection of user trends too. Hospitality managers should not only integrate ICTs into the strategies followed by companies but also work at a tactical and operational level, enhancing their employees' knowledge of ICT trends (Ip et al., 2011; Law et al., 2014).

4.4. Limitations and Future Research

Concerning limitations, the most important one stems from the selection of works subject to examination, since our analysis focused on papers published in only 7 journals, thus leaving aside other publication sources. Nevertheless, this limitation regarding the works examined is inherent to any type of literature review papers and has often been found in previous studies of this kind. For instance, the work authored by Leung et al. (2015b) on Internet marketing research in hospitality and tourism was based on the analysis of eight journals. Similarly, Ip et al. (2011) analyzed ICT-related research articles published in only eight journals too. In turn, Serra Cantallops and Salvi (2014) studied the influence of eWOM through six tourism journals and Law et al. (2013) examined the ICT-related papers published in only one journal (Cornell Hospitality Quarterly). Furthermore, we have exclusively analyzed articles because of their proven impact, leaving aside all the research published through books or presented to Conferences, even though this limitation is also shared by similar works (Law et al., 2014)."

Moreover, examining the evolution of literature over 27 years has the drawback that a number of articles as well as the technologies they deal with seem obsolete at present –it allows us to check the evolution regarding the importance of the topics examined or the research methods, though. In view of all the above, it is actually our contention that the present paper can prove useful both for researchers and for hotel managers, since new trends are emerging in both contexts, with

regard to technologies themselves as well as to some of their uses, which can pave the way for future research works and potential applications in hotel management.

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Figure 1: Topics by period

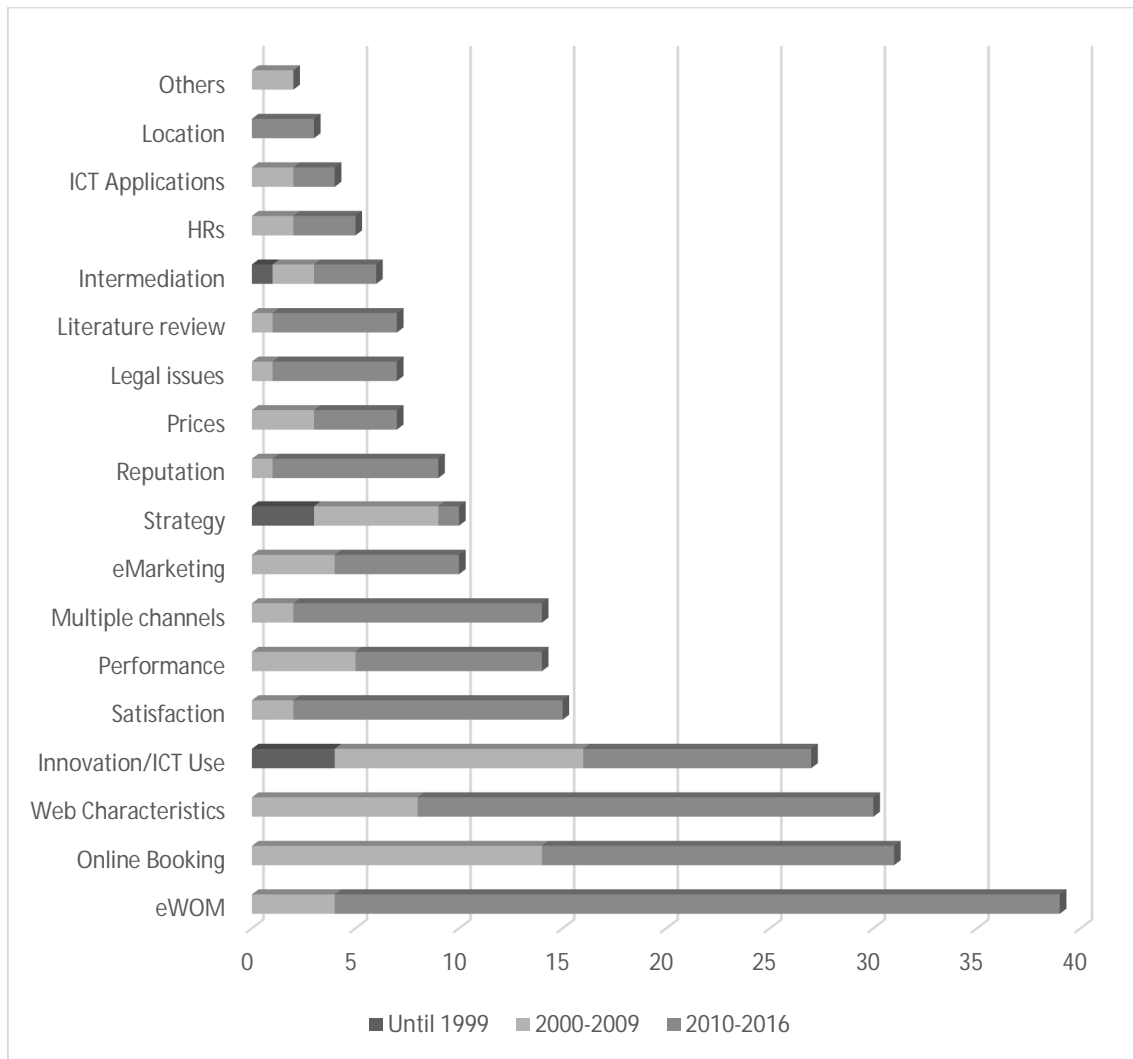


Figure 2: Authorship/Co-authorship by period

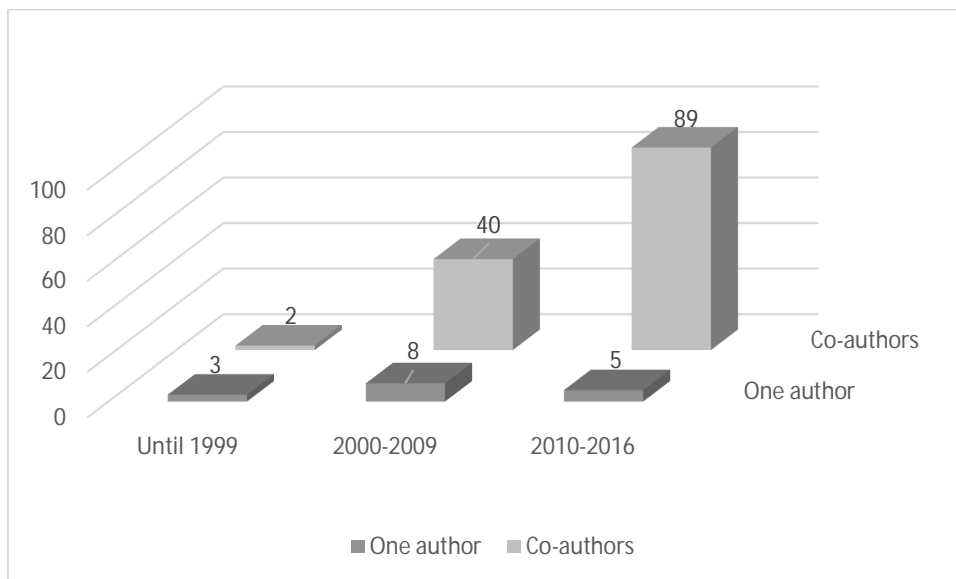


Table 1: Journals analyzed and Number of papers analyzed by journal

Journal	Proquest	SCCI 2016 (Quartile)	O'Connor and Murphy (2004)	Ip et al. (2011)	Leung et al. (2015b)	N.	%
IJCHM	*	3.196 (Q1)	*	*	*	49	33.3
IJHM	*	2.787 (Q1)	*	*	*	46	31.3
CHQ	*	2.657 (Q1)		*	*	29	19.7
TM	*	4.707 (Q1)	*		*	12	8.2
JHTR	*	2.646 (Q1)		*	*	6	4.1
IJTR	*	1.857 (Q2)				3	2.1
ATR	*	3.194 (Q1)	*		*	2	1.3
TOTAL						147	100.0
IJCHM=International Journal of Contemporary Hospitality Management; IJHM=International Journal of Hospitality Management; CHQ=Cornell Hospitality Quarterly; TM= Tourism Management; JHTR=Journal of Hospitality & Tourism Research; IJTR=International Journal of Tourism Research; ATR= Annals of Tourism Research							

Table 2: Research Methodologies, Perspectives and Statistical Techniques by Period

METHODOLOGIES								
	Until 1999		2000-2009		2010-2016		Total	
	N.	%	N.	%	N.	%	N.	%
EMPIRICAL	3	2.0	44	29.9	90	61.2	137	93.2
Field studies	3	2.0	25	17.0	30	20.4	58	39.5
Content Analysis	0	0.0	9	6.1	30	20.4	39	26.5
Experiment	0	0.0	3	2.0	15	10.2	18	12.2
Case studies	0	0.0	6	4.1	6	4.1	12	8.2
Literature Review	0	0.0	1	0.7	6	4.1	7	4.8
Case/Field Studies	0	0.0	0	0.0	2	1.4	2	1.4
Experts' Panel	0	0.0	0	0.0	1	0.7	1	0.7
THEORETICAL	2	1.4	4	2.7	4	2.7	10	6.8
PERSPECTIVES								
Hotel	3	2.0	31	21.1	28	19.0	62	42.2
User	0	0.0	12	8.2	48	32.7	60	40.8
Hotel/User	0	0.0	4	2.7	7	4.8	11	7.5
NA (Not Applicable)	2	1.4	1	0.7	11	7.5	14	9.5
STATISTICAL TECHNIQUES								
Descriptive	1	0.7	7	4.8	12	8.2	20	13.6
Univariate	1	0.7	11	7.5	17	11.6	29	19.7
Multivariate	0	0.0	13	8.8	35	23.8	48	32.7
SEM/Path A.	0	0.0	5	3.4	14	9.5	19	12.9
NA	3	2.0	12	8.2	16	10.9	31	21.1
TOTAL	5	3.4	48	32.7	94	63.9	147	100.0

Table 3: Topics and Technologies by Period

	TOPICS							
	Until 1999		2000-2009		2010-2016		Total	
	N.	%	N.	%	N.	%	N.	%
eWOM	0	0.0	4	1.7	35	14.6	39	16.3
Online Booking	0	0.0	14	5.8	17	7.1	31	12.9
Web Characteristics	0	0.0	8	3.3	22	9.2	30	12.5
Innovation/ICT Use	4	1.7	12	5.0	11	4.6	27	11.3
Satisfaction	0	0.0	2	0.8	13	5.4	15	6.3
Performance	0	0.0	5	2.1	9	3.8	14	5.8
Multiple channels	0	0.0	2	0.8	12	5.0	14	5.8
e-Marketing	0	0.0	4	1.7	6	2.5	10	4.2
Strategy	3	1.3	6	2.5	1	0.4	10	4.2
Reputation	0	0.0	1	0.4	8	3.3	9	3.8
Prices	0	0.0	3	1.3	4	1.7	7	2.9
Legal Issues	0	0.0	1	0.4	6	2.5	7	2.9
Literature Review	0	0.0	1	0.4	6	2.5	7	2.9
Intermediation	1	0.4	2	0.8	3	1.3	6	2.5
HRs	0	0.0	2	0.8	3	1.3	5	2.1
ICT Applications	0	0.0	2	0.8	2	0.8	4	1.7
Location	0	0.0	0	0.0	3	1.3	3	1.3
Others	0	0.0	2	0.8	0	0.0	2	0.8
Total	8	3.3	71	29.6	161	67.1	240	100.0
	TECHNOLOGIES							
	Until 1999		2000-2009		2010-2016		Total	
	N.	%	N.	%	N.	%	N.	%
Web	0	0.0	18	10.4	23	13.3	41	23.7
General ICT	3	1.7	16	9.2	14	8.1	33	19.1
Travel-related Social Networks	0	0.0	2	1.2	29	16.8	31	17.9
Generic Social Networks	0	0.0	0	0.0	18	10.4	18	10.4
OTAs	0	0.0	3	1.7	13	7.5	16	9.2
Internet	0	0.0	6	3.5	6	3.5	12	6.9
Customer ICTs	0	0.0	2	1.2	2	1.2	4	2.3
E-mail	0	0.0	3	1.7	1	0.6	4	2.3
Mobile ICTs	0	0.0	0	0.0	4	2.3	4	2.3
CRS	2	1.2	0	0.0	2	1.2	4	2.3
GIS/GPS	0	0.0	0	0.0	3	1.7	3	1.7
CRM	0	0.0	1	0.6	1	0.6	2	1.2
Big Data	0	0.0	0	0.0	1	0.6	1	0.6
Total	5	2.9	51	29.5	117	67.6	173	100.0

Table 4: Papers published by Author and Country

AUTHORS					
Author	N.	Country	Author	N.	Country
Law. R.	32	China	Leung. D.	2	China
Mattila. A.S.	6	USA	Leung. X.Y.	2	USA
Morosan. C.	5	USA	Levy. S.E.	2	USA
Buhalis. D.	4	UK	Li. G.	2	Australia
Guillet. B.D.	4	China	Magnini. V.P.	2	USA
Murphy. H.C.	4	Switzerland	Main. H.	2	UK
Cobanoglu. C.	3	USA	Melián-González. S.	2	Spain
DeFranco. A.	3	USA	Minazzi. R.	2	Italy
Hung. K.	3	China	Murphy. J.	2	Australia
Kim. T.	3	South Korea	Qu. H.	2	USA
Kim. W.G.	3	USA	Rattray. R.	2	UK
Lee. H.	3	China	Raven. P.	2	USA
Leung. R.	3	China	Reynolds. D.	2	USA
O'Connor. P.	3	France	Schegg. R.	2	Switzerland
Wang. L.	3	China	Sigala. M.	2	Greece
Xie. K.L.	3	USA	Su. N.	2	China
Zhang. L.	3	USA	Tanford. S.	2	USA
Au. N.	2	China	Toh. R.S.	2	USA
Berezan. O.	2	USA	Verma. R.	2	USA
Bulchand-Gidumal. J.	2	Spain	Williams. R.	2	UK
DeKay. C.F.	2	USA	Ye. Q.	2	China
Duan. W.	2	USA	Yu. Y.	2	USA
Goh. C.	2	China	Zhang. Zili	2	China
Inversini. A.	2	UK	Zhang. Ziqiong	2	China
Karadag. E.	2	USA			
COUNTRIES					
Country	N.	Country	N.	Country	N.
USA	124	Italy	6	Finland	2
China	101	Canada	5	Netherlands	2
UK	31	France	4	Singapore	2
Spain	24	Greece	4	Thailand	2
Australia	13	India	3	Austria	1
South Korea	13	Israel	3	Denmark	1
Switzerland	13	New Zeland	3	Malaysia	1
Taiwan	10	Portugal	3		
Turkey	8	Brazil	2		

APPENDIX

Table 5: Topics and Research Methodologies

Paper	Research Methodologies	Topics
Akincilar and Dagdeviren (2014)	CA	WC
Aksu and Tarcan (2002)	FS	WC
Aluri et al. (2015)	E	WC. OB. Sa. eW
Anckar and Walden P (2001)	Case Study	Inn
Avcikurt et al. (2011)	FS	Inn
Banerjee and Chua (2016)	CA	EW
Beaver (1992)	T	Inn
Berezan et al. (2015)	CA	eW. Sa
Berezina et al. (2012)	E	LI. eW. Sa
Beritelli and Schegg (2016)	FS	OB. MC
Blal and Sturman (2014)	CA	eW. P
Boffa and Succurro (2012)	CA	OB
Buhalis and Main (1998)	FS	Inn. Int. S
Buick (2003)	FS	Inn
Camisón (2000)	FS	S
Casaló et al. (2015)	E	OB. eW
Chung and Law (2003)	CA	WC
Collier (1989)	T	Inn
Crichton and Edgar (1995)	FS	S. Inn
Díaz and Koutra (2013)	CA	WC
Duan et al. (2016)	CA	eW
Dwivedi et al. (2007)	CA	eW
Escobar-Rodríguez and Carvajal-Trujillo (2013)	CA	eW. WC
Espino-Rodríguez and Gil-Padilla (2005)	FS	S
Gazzoli et al. (2008)	CA	OB. Int. P. MC
Gibbs et al. (2015)	FS	RRHH. Inn
Gray et al. (2000)	FS	Inn. P
Gröschl (2011)	CA	R. S. HRs
Guillet and Law (2010)	CA	OB
Ham et al. (2005)	FS	P. Inn. ICT
Hamilton et al. (2012)	T	Int. LI
Hashim et al. (2009)	CA	Inn
Herrero et al. (2015)	FS	eW. WC
Hills and Cairncross (2011)	CS	eW
Hsieh (2012)	CA	WC
Hsu (2012)	CA	Inn. eM
Hua et al. (2015)	CA	P
Huh et al. (2009)	FS	Inn. HRs
Hung and Law (2011)	LR	LR
Inversini and Masiero (2014)	FS	OB. MC
Ip et al. (2011)	LR	LR
Karadag et al. (2009)	FS	Others
Karadag and Dumanoglu (2009)	FS	P. ICT
Karande and Magnini (2011)	FS	MC. P
Kim and Kim (2004)	FS	OB
Kim et al. (2011a)	FS	HRs. Inn
Kim et al. (2016)	CA	eW. Sa
Kim et al. (2008)	FS	Inn
Kim and Mattila (2011)	CFS	WC
Kim et al. (2011b)	FS	eW. OB
Kim and Qu (2014)	FS	Inn. ICT. Sa
Kim et al. (2010)	FS	Inn
Kuo et al. (2015)	FS	WC. eW

Kwok and Xie (2016)	CA	eW
Ladhari and Michaud (2015)	E	eW. OB. Sa
Lam et al. (2007)	FS	Inn. HRs
Law (2009)	FS	Int. OB
Law and Cheung (2006)	FS	WC
Law and Hsu (2005)	FS	WC
Law and Jogaratnam (2005)	CS	S
Law and Lau (2000)	CS	Others
Law et al. (2014)	LR	LR
Law et al. (2007)	CS	MC. P
Law et al. (2013)	LR	LR
Law et al. (2015)	CS	Int. MC
Lee et al. (2013a)	E	Sa. LI. WC
Lee et al. (2013b)	CA	MC
Leung and Law (2013)	CS	Inn
Leung et al. (2015a)	FS	eW. OB
Leung et al. (2015b)	LR	LR. eM
Levy et al. (2013)	CA	eW. R
Li and Law (2007)	E	WC
Li et al. (2015a)	CA	L
Li et al. (2015b)	FS	eM. WC
Lim (2009)	T	Inn
Ling et al. (2015)	T	MC. OB
Liu and Zhang (2014)	CFS	WC. OB
Liu and Mattila (2016)	E	ICT
Liu et al. (2013)	E	eW
Magnini and Honeycutt (2009)	FS	R. eM
Main (1995)	FS	S
Martin (2004)	CS	Inn
Mattila and Mount (2003)	FS	Sa
Mauri and Minazzi (2013)	E	eW
Melián-González and Bulchand-Gidumal (2016)	CS	P
Melián-González et al. (2013)	CA	eW
Mills et al. (2008)	CA	WC
Morosan (2012)	FS	Inn
Morosan and DeFranco (2015)	FS	LI. Sa
Morosan and DeFranco (2016)	FS	LI. Inn
Morosan and Jeong (2008)	FS	Inn. OB
Murphy and Kielgast (2008)	CS	eM. WC
Murphy and Rottet (2009)	FS	Inn
Murphy et al. (2016)	FS	OB. MC
Noone and Mattila (2009)	FS	OB. P
O'Connor (2008)	E	eM. LI
O'Connor and Murphy (2004)	LR	LR
Pan et al. (2013)	E	WC. OB
Paraskevas et al. (2011)	EP	eM
Park and Allen (2013)	CS	R
Piccoli (2008)	T	S
Poria and Oppewal (2003)	T	eW
Raab et al. (2016)	FS	eW. Sa
Rong et al. (2009)	FS	WC
Rose and Blodgett (2016)	E	R. eW
Sahadev and Islam (2005)	FS	Inn
Schmidt et al. (2008)	CA	WC. P
Šerić et al. (2014)	FS	R
Serra Cantallops and Salvi (2014)	LR	eW. LR
Shoval et. (2011)	E	L
Sigala (2005)	FS	eM. S

Sigala et al. (2001)	T	OB. S
Silveira Chaves et al. (2012)	CA	eW
Sparks and Browning (2011)	E	eW. OB. Sa
Stangl et al. (2016)	FS	MC
Su et al. (2015a)	FS	R. eM
Su et al. (2015b)	CA	R. eM
Thakran and Verma (2013)	T	Int. MC
Ting et al. (2013)	CA	WC
Toh et al. (2011a)	FS	OB. MC
Toh et al. (2011b)	CS	WC. MC. P
Tsao et al. (2015)	E	OB. eW
Verma et al. (2012)	FS	OB. MC
Vermeulen and Seegers (2009)	E	eW. OB
Viglia et al. (2016)	CA	eW. P
Wang et al. (2014)	FS	WC. Sa
Wang et al. (2015)	FS	WC. Sa. OB
Wang et al. (2016)	FS	Inn
Williams and Rattray (2005)	CA	WC
Williams et al. (2006)	CA	WC
Wilson et al. (2012)	FS	eW
Wilson (2011)	T	OB. LI
Wong and Law (2005)	FS	OB. WC
Wu et al. (2013)	FS	OB. WC
Wu and Lu (2012)	FS	P
Xiang et al. (2015)	CA	eW. Sa
Xie et al. (2011)	E	eW. OB
Xie et al. (2014)	CA	eW. P. R
Xie et al. (2016)	CA	eW. P
Yang et al. (2015)	CA	L. P
Yang et al. (2016)	E	P
Ye et al. (2009)	CA	eW. P
Ye et al. (2014)	CA	P. eW
Yen and Tang (2015)	CA	eW. P
Yeung and Law (2004)	FS	WC
Zafiroopoulos et al. (2006)	CA	WC. Sa
Zhao et al. (2015)	FS	OB. eW

CA=Content Analysis, CS=Case Study, CFS=Case/Field Study, E=Experiment, EP=Experts' Panel, FS=Field Studies, LR=Literature Review, T=Theoretical

eM=eMarketing, eW=eWOM, HRs=HRs, ICT=ICT Applications, Inn=Innovation/ICT Use, Int=Intermediation, LI=Legal Issues, LR=Literature Review, L=Location, MC=Multiple Channels, OB=Online Booking, O=Others, P=Performance, Pr=Prices, R=Reputation, Sa=Satisfaction, S=Strategy, WC=Web Characteristics